The Foundations of the Cost Proposal

By: Bob Webster

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Presentation Scope

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- A detailed discussion of the information needed to accurately and effectively estimate a proposal's cost displayed as a process flowchart to identify the most effective sequence of events.
- The presentation is created to inform and to act as a catalyst to help the listener evaluate their own processes.
- Focus of the proposal process is large government proposals, from a company that produces electro mechanical chemical rocket systems and armament.
- The proposal process has 3 main phases:
  - Conceptual
  - Costing
  - Pricing/publishing

Process Overview

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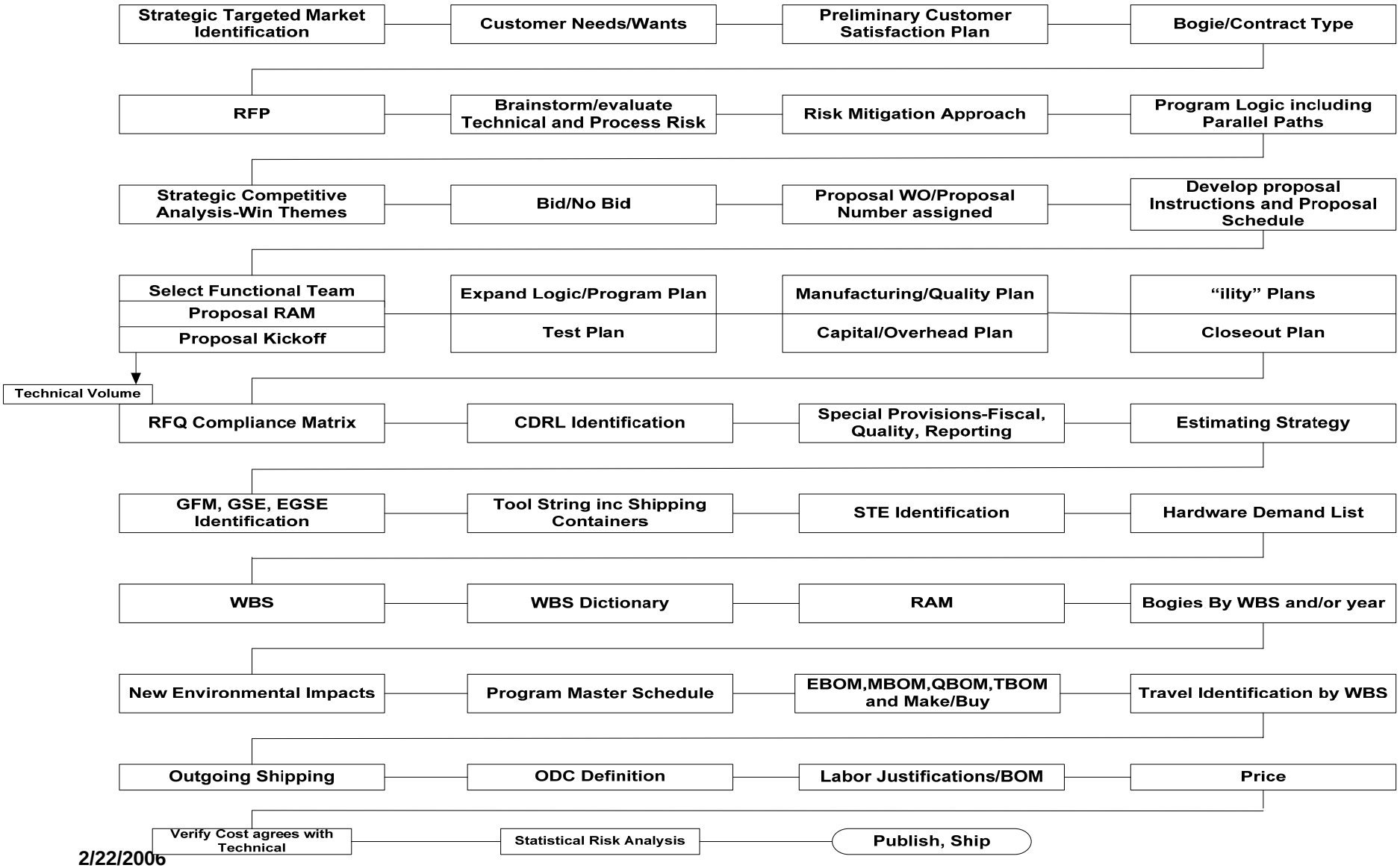

Program Concept Phase

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- The strategic target market identification is defined by your company management which also prepares your salespeople to display the companies capabilities in front of the customer.
- The display of your companies technologies and processes provides a method for the customer's need and wants to be fulfilled.
- Once the customer's dreams seem have a solution, they ask for white papers to let the rest of the potential competitors respond with their solutions. Those responses are usually requested by a RFI and are responded to with "White Papers" that form the Preliminary Satisfaction Plan from your company.
- During that time potential costs are talked about and sometimes presented as ROMs in the white papers.
- That results in a RFP being issued followed by a Bid/No Bid meeting in your company.

Selected Risk Mitigation Approach

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- **For every technology or process you have not done before conceptualize the effort required to move to maturity. This is conceptual in nature and can involve multiple program, multiple colors of money and numerous assumptions.**

Development Logic Diagram/Parallel Path

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- Purpose: **a notional technology and process maturation plan showing parallel paths required to meet customer's needs/wants.**
- Who: **Usually the Program Manager and Lead Engineer**
- What: **On a media that all can see with timelines and decision gates.**
- Where: **At the home plant but initial concept is usually at the customer's.**
- When: **Prior to Bid/No Bid. If done after Bid/no-bid everybody waits for it or guesses.**
- Why: **Provides the development logic for the program so the team is on the same path. Provides comparison to previous efforts allowing rough sizing.**
- How many: **up to one for each component.**
- Example: **See next page.**

Early Program Logic Diagram

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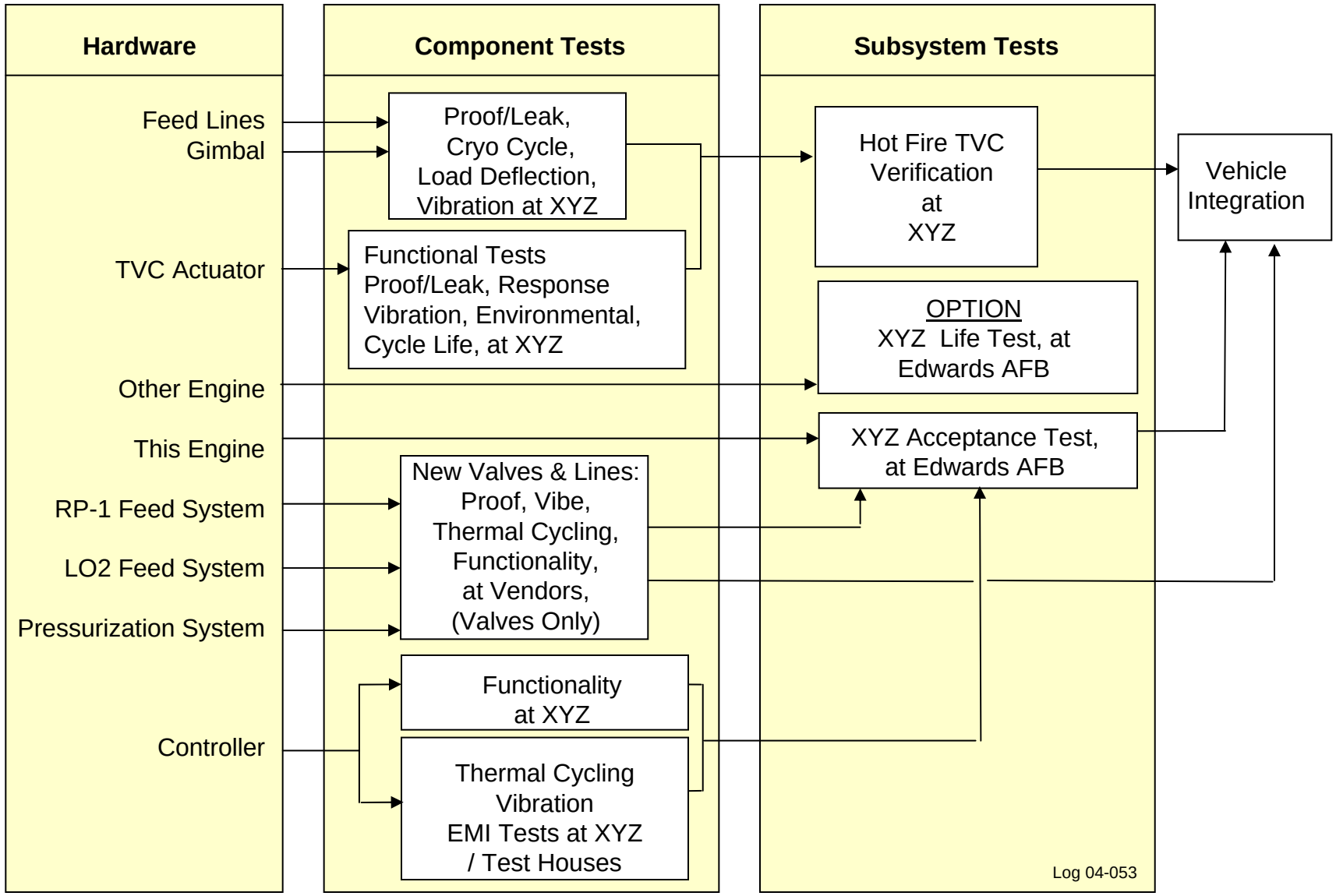

Win Themes

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- **Purpose: Identify Technologies and Processes only achievable by your team.**
- **Who: Program Manager and Strategic Planner.**
- **What: List of win themes expected to be proven during the program.**
- **Where: Available display media to team**
- **When: Prior to cost and technical writing kickoff**
- **Why: Both cost and technical writers need definition to allow focus**
- **How many: Numerous or one.**
- **Example: Our low cost Carbon Silicon Carbide technology allows high performance due to lightest possible weight for high temperature structures.**

Bid/No-Bid

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- **Purpose: Authorizes company B+P resources for proposal creation.**
- **Who: Program Manager presents to Marketing council.**
- **What: Display Program Logic, approximate program price vs market price, win probability, competition, team needed and schedule (include mgmt signoff). Discuss staffing.**
- **Where: At company.**
- **When: Prior to Kickoff**
- **Why: Numerous opportunities exist for scarce resources.**
- **How many: 1**
- **Example: NONE**

Cost Phase

- **Once the Bid/no-Bid happens a proposal work order is created, a proposal number is assigned and the cost phase of the proposal starts.**

Proposal Instructions/Proposal Schedule

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- **Purpose: Displays expectations to the team**
- **Who: Proposal Manager**
- **What: Team assignments given out with due dates**
- **Where: Proposal Room**
- **When: As soon as possible after the Bid-No Bid**
- **Why: So all of the team members know who is doing what and when.**
- **How many: One time and updated daily if needed**
- **Example:**

What	Who	When Due
Storyboards	All authors	1/2/04 9 a.m.
Graphics	All authors	1-3-04 2 p.m.
Analog costs	Estimator	1-6-04 1 p.m.

This usually is accompanied by a MS Project Schedule displaying all of the technical and costing steps necessary to create the proposal, who is responsible, and when due.

Select Functional Team

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- **Purpose: Identify team members**
- **Who: Proposal Manager with functional managers**
- **What: Identify the individuals needed to create the technical and cost volume.**
- **Where: various offices**
- **When: After Kickoff**
- **Why: Used to get functional manager buy in**
- **How many: Once with deviations as required.**
- **Example:**
  - **System write up /tech vol. — Joe Smith**
  - **Injector development — Sue Jones**
  - **Chamber development — Bill Evans**
  - **Valve design — Fred Williams**
  - **Valve Electronics — Pat Fisk**
  - **Valve Software — Anne Adams**
  - **Quality Plan — Evan Thomas**
  - **Management Plan — Jim Allen**
  - **Manufacturing Plan — Jean Pierce**
  - **Priced BOM — Carl Jackson**
  - **Costing — Jen Brown**
  - **Pricing/Volume — Jerry Walls**

Proposal RAM

- **Purpose: Identifies the individuals responsible for the Proposal**
- **Who: Proposal Manager**
- **What: A matrix of individuals and assignments.**
- **Where: Usually posted in the Proposal Room-need feedback that says people know and will respond.**
- **When: At proposal Kickoff.**
- **Why: Need communication to contributors**
- **How Many: One with redlines.**

Proposal Kickoff Checklist

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- **Purpose: Identifies items required to effectively start a proposal.**
- **Who: Proposal Manager**
- **What: A list of items handed out at the proposal kickoff meeting.**
- **Where: Posted in proposal room.**
- **When: After team selection but before tech/cost work started.**
- **Why: This event signifies the start of the proposal.**
- **How Many: One**
- **Example:**

	Cost	Proposal	Checklist
Due date	completed	task/doc	who
		Bid/no bid	
		B+P work order	
		Proposal number	
		Proposal RAM	
		Proposal Instructions	
		Proposal Schedule	
		Program Schedule	
		WBS tree	
		Estimating stratagy	
		prelim Logic	
		hardware demand	
		travel plan	
		etc	

Expanded Logic/
Program Plan/Test Plan

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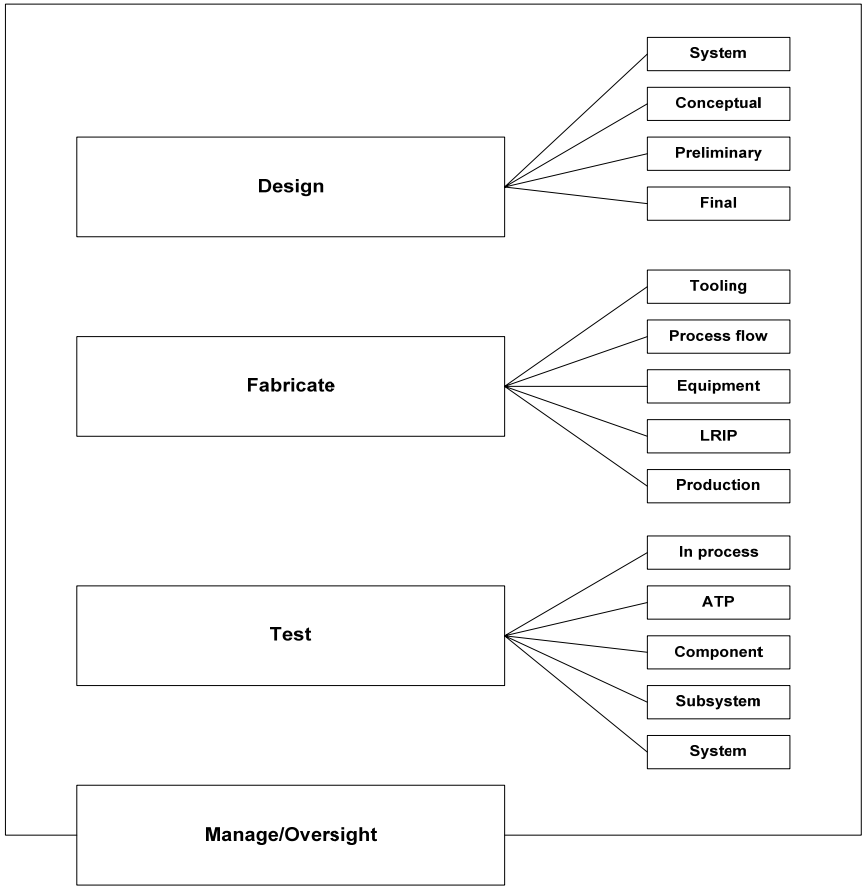
- Purpose: Describes the system/component development
- Who: Proposal Manager-Lead Engineer with help from authors.
- What: This is a description of the program described by the Logic Plan.
- Where: Usually the proposal room
- When: Shortly after the kickoff
- Why: The customer and proposal contributors need this to size the program.
- How many: Multiple times until it says what you want.
- Example:



Manufacturing/Capital Plan

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- **Purpose: Shows the work process flow to create the hardware and software**
- **Who: Usually the manufacturing or software engineer.**
- **What: Defines location and facility modifications required to accomplish the development program.**
- **Where: Usually in the mfg area but sometimes in the proposal room.**
- **When: During the creation of the program plan.**
- **Why: Process flow plan acts as the basis of program comparison to cost and show any process development.**
- **How many: Once.**
- **Example: See next page for flowchart**
  - **<u>Capital Plan</u>**
  - **1. Modify existing work center for integrated CAD-CAM control.-$1.7 M**
  - **2. Remove old Cincinnati lathe, repair mounting and floor-$750K**
  - **3. Design/fabricate old blivet line to allow rate of 2000 newthings/year- $3.7 M**
  - **4. Fabricate and test a programmable universal controller tester- $8.6 M**
  - **5. Repave and fence in storage area for all of those newthings- $208K**

Manufacturing Flow Chart

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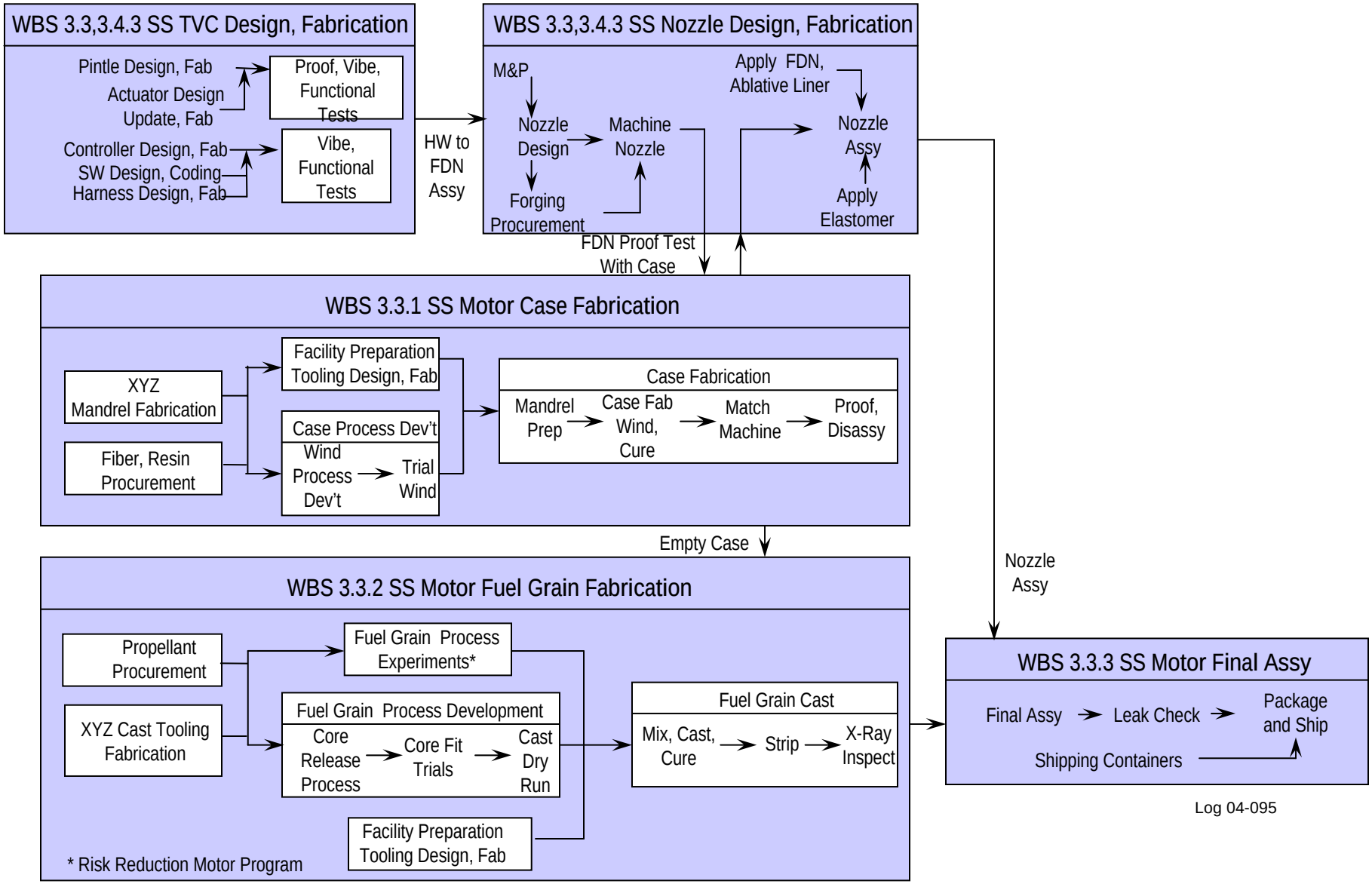

Log 04-095

Quality Plan

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- **Purpose: Identifies customer/company oversight requirements-especially delivered hardware.**
- **Who: Lead Quality Engineer**
- **What: Description of process creation, verifications and systems in place to provide error free hardware.**
- **Where: Usually in Quality Leads office.**
- **When: In parallel with the Program Plan/mfg/test plan**
- **Why: The quantity of systems checks and internal oversight has a cost.**
- **How many: One**
- **Example: Discussion of factors affecting quality costs.**

“ility” Plans/closeout plans

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- Purpose: To Identify any other reliability, fabricability, maintainability efforts needed
- Who: Usually lead Engineer with help from functions.
- What: Describes methods and logic of interest to customer.
- Where: Usually done and posted in the Program Plan.
- When: After Manufacturing Plan, before compliance matrix.
- Why: When “ility plans” are required by the RFP.
- How Many: One
- Example: None

Closeout Plan

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- **Purpose: Allows you to carefully close out the program without using Overhead money to do it.**
- **Who: Proposal Manager or Project Engineer**
- **What: A document that describes the events that happen when a program ends.**
- **Where: In the proposal room.**
- **When: During the proposal-prior to costing or becomes part of the terms and conditions.**
- **Why: If programs demand it.**
- **Example: none**

RFQ Compliance Matrix

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- **Purpose: Connects the elements of the Logic Diagram/Program plan to customer's needs/wants.**
- **Who: Lead Engineer**
- **What: Usually matrix format with RFQ item and Program Plan connection**
- **Where: Done in proposal room**
- **When: Upon completion of preliminary program plan.**
- **Why: No other document comprehensively "answers the mail"**
- **How many: Once with updates until all needs/wants met.**
- **Example: See next sheet.**

RFP Compliance Matrix

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Part I. Common Instructions	Requirements	Proposal Section/ Comments
1.3 Goals and Objectives	**• Goal is to engage creativity and ingenuity of industry and academia to meet goals and objectives of XYZ Program. Objectives include:**	**INFORMATION**
	a) Acquire Technology Risk Reduction activities, which should be traceable to XYZ goals.	**2.0, 2.1, 2.2**
	b) Propose meaningful risk reduction activities that address NASA's XYZ goals.	**3.1, 4.3**
	c) Develop flexible contracts, milestones, decision gates, priced options	**3.3.1, 3.3.2, 4.3.1, 4.3.2, 7.1**
	• Provide for adequate reporting to ensure appropriate Government insight.	**6.4, 7.4, 7.5**
1.4 Guidelines and References	**• Proposals shall use English Units**	**INFORMATION**
2.0 Technology Area Description	**Proposing under XYZ**	**INFORMATION**
2.2 Technology Maturity	**• For each TA the offeror shall describe the current maturity of the technology proposed**	**3.2.3, 4.2.3**
	• Use the Technology Readiness Level (TRL) definitions from the Common Instructions page PI-6	**3.2.3, 4.2.3**
	• Address whether the proposed technology is new or has been developed with Government funds, industry funds, or IRAD funding	**3.2.3, 4.2.3**

CDRL Identification

- **Purpose: To identify the effort required to communicate documents to the customer.**
- **Who: Lead Engineer or designated individual.**
- **What: A list of all customer documents with their due dates.**
- **Where: Probably proposal room and usually derived from RFP.**
- **When: During or after RFP compliance-before WBS creation**
- **Why: To identify if the documentation task is our normal process or special.**
- **How many: Once.**
- Example:

Document	How Many	Initial Due	Subsequent
Program Plan	1	with prop	none
Master Schedule	a/r	with prop	Quarterly
Cost reporting	a/r	ATP + 1 mo	monthly
Quality Plan	1	Prop + 2 mo	none
Mfg plan	1	Prop + 1 mo	none
CoDR package	1	ATP + 6 mo	none
PDR package	1	ATP + 12 mo	none
CDR package	1	ATP + 16 mo	none

Identify Special Provisions such as Fiscal, Quality, Reporting Methodology, or Post Delivery Support.

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Purpose: To allow special needs to be recognized and costed.
Who: Proposal Manager or delegated.
What: Identify the unusual so costing can occur.
Where: Proposal Room after re-reading RFP.
When: After Compliance Matrix is finished.
Why: Special systems cost money to set up and maintain.
How many: May be multiple if customer verbally requests.
Example:

Fiscal issue: RFP does not ask for CSSR but asks for all it contains.
MRB authority resides with the customer during development.
Reports to be generated on system XYZ which we don't have.
Customer wants on call support for first 2 years.

Estimating Strategy

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- Purpose: Allows the methodology to be selected-analog, bottoms-up, CER ect.
- Who: Usually between Program Manager, Proposal Manager, Estimator.
- What: Discussion of method used to generate costs
- Where: Proposal Room.
- When: Can start as early as when the Logic/Preliminary Program Plan is done.
- Why: To prevent multiple iterations of costs.
- How many: One with preliminary bogies.
- Example:
  - Injector development similar to LOX –Hydrocarbon XYZ injector
  - Chamber development similar to XYZ
  - Valve development similar to XYZ prototype
  - Controller and software similar to XYZ
  - Quality similar to NASA XYZ
  - Procurement per company standard CER
  - PM, Fiscal, Contracts LOE at x hrs/mo.
  - Post delivery support LOE full time for 2 months
  - CDRLs costed as bottoms up by functions

GFM,GSE,EGSE

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- **Purpose: Identifies material or support equipment supplied by or delivered to the customer.**
- **Who: Lead Engineer or Proposal Manager.**
- **What: GFM is material supplied by the government, GSE is (delivered) Ground Support Equipment and EGSE is Electronic Ground Support Equipment.**
- **Where: Should come from RFP but mostly is verbal. Post in proposal room.**
- **When: Prior to BOM and Tool string identification.**
- **Why: Catches and displays customer requirements sometimes not well communicated.**
- **How many:1 plan with updates.**
- **Example:** **CFM customer to supply 1 ea. 6 " dia. X 30 " Molybdenum Billets**

  GSE-Pressurization flow cart required for ATP at customer plant.

  EGSE- Computerized, touch operating console required to operate system, take data and print.

Tool String inc Shipping Containers

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- **Purpose: Defines required tools for manufacturing, shipping and handling.**
- **Who: Manufacturing Engineer and Tool Design Engineer**
- **What: Specific title and function list**
- **Where: Post in proposal room.**
- **When: Prior to BOM, Hardware Demand, after Mfg Plan**
- **Why: Tools are usually the most underestimated part of the proposal.**
- **How many: 1 time with revisions when manufacturing plan is changed.**
- **Example:**

Tool Number	Tool Name	New or Mod	Descriptions	TE SH	TD SH	M$	Tool Shop HH	Tool Shop SH	Proof Load HH	Fab Time
Tools ~ Nozzle										
	Unidentified Final Assy Tools 5% of Total			26	38	$8,408	30	18	4	
T1043657	Lift Beam	New	New tool due to config change	26	40	$0	0	0	8	
T2000523	Tape Wrap Mandrel Exit Cone	Mod	(3) new Details	26	40	$3,000	60	32	8	
T2000552	Wrap Mandrel, FWD Throat	Mod	New tool details for Block B	16	24	$15,000	0	0	0	
T2000579	Machining Mandrel	Mod	New Clamp Plate	26	40	$2,000	60	32	0	
T2001399	Machining Fixture, I.D.	New	New Clamp Plate/New Tool Was T2000581	21	32	$8,000	0	0	0	
T2001415	Vacuum Bag, Exit Cone	New	New tool due to config change can not modify	33	50	$20,000	0	0	0	

STE Identification

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- **Purpose: Defines Special Test Equipment-normally delivered with hardware.**
- **Who: Lead Engineer-possibly defined in RFP**
- **What: List of Equipment to be created, verified and delivered including procedures if necessary**
- **Where: Probably during Manufacturing plan review or RFP review**
- **When: Prior to Hardware Demand list**
- **Why: So delivered Items are accounted for.**
- **How many: One-hopefully agreed on by customer.**
- **Example: Valve Protractor**
  Weight/Cg Digital Readout Rack
  Gimbal alignment/measurement tools
  Instrumentation Calibration Devices

Residual Material Identification/Transfer

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- **Purpose: To identify transferred and unused customer owned material.**
- **Who: Provisioner, Lead Engineer or others**
- **What: Quantities and description of all materials not used.**
- **Where: Posted as part of the Hardware Demand to end up in BOM**
- **When: Prior to BOM.**
- **Why: Need to disclose deliverable assets to the customer.**
- **How many: one**
- **Example:**
    - **3 ea. 6” Dia. X 30” long Molybdenum Billets returned to XYZ**

Hardware Demand List

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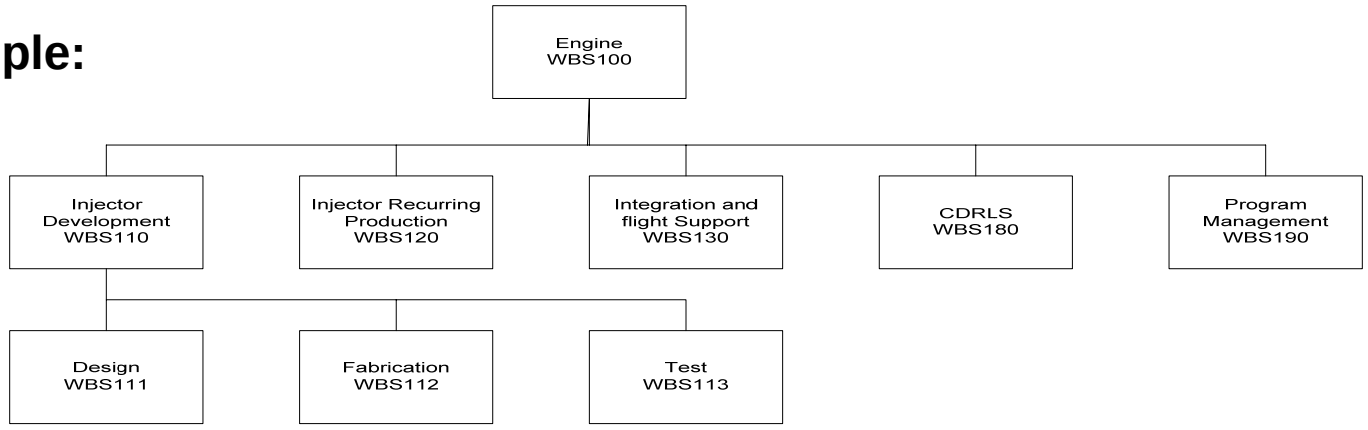
- Purpose: On a top level describe the hardware flow.
- Who: Lead Engineer
- What: By program phase describe what is bought, manufactured and tested.
- Where: Derived from the logic diagram and posted in the proposal room.
- When: Prior to the BOM and after the Program Plan.
- Why: Acts as the starting point for hardware flow for all team members.
- How many: 1 with revisions.
- Example:

WBS	Item name	Quantity	Date Required	Use
111	Flow devices	12	9-12-05	test
	Leak ck tool	1	8-1-05	mfg
	Shipping containers	6	8-1-05	mfg
112	Weld alignment tool	1	3-14-07	mfg
	Platelet injector	6	4-1-07	4 del,2 test
	Proof tool	1	3-18-07	test
	Flow plates	2	3-19-07	mfg
113	Vibration fixture	1	5-23-07	test

WBS creation

- **Purpose: Provides a numerical identity to each program element.**
- **Who: Customer furnished or the Program Manager.**
- **What: Based on Hardware/Software, Task, Functional Group, Phase or Document. Usually a combination of all of those.**
- **Where: Create and permanently displayed in the proposal room.**
- **When: After the program has been conceptualized and you understand what type of identification you need for the proposal, control and post program data analysis.**
- **Why: Use of a WBS will avoid overlooking work elements, allow control and give a reference to all tasks.**
- **How many: 1 time**
- **Example:**



WBS Dictionary

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- **Purpose: Provides a description of each functional task.**
- **Who: System Engineer or Project Engineer with oversight from Lead Engineer.**
- **What: A WBS oriented task description document that identifies the event needed to complete the task.**
- **Where: Done and displayed in the Proposal Room.**
- **When: After WBS creation, prior to the RAM.**
- **Why: Allows the identification of the work scope for all functional groups.**
- **How many: 1 with revisions.**
- **Example:**

WBS111-Injector Design-Conceptualizes an Injector using the new xyz flow methods, performs flow experiments to assure subscale minimized mal-distribution. Performs all design trades. Holds Concept design review. Creates preliminary full scale design including Igniter, valves and feed lines. Conducts and presents all analysis and preliminary drawings at PDR. Finishes design and drawings. Creates manufacturing and test plan. Creates hardware weight.

Responsibility Assignment Matrix

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- **Purpose: Connects the WBS Dictionary to the proper functional group.**
- **Who: System Engineer or PE.**
- **What: Oriented to WBS and Task and should be no more the a “x” or check in the appropriate functional group.**
- **Where: Post in the proposal room.**
- **When: After the WBS Dictionary and before the Schedule.**
- **Why: Allows the proper working group to be estimated and scheduled.**
- **How many: 1**
- **Example:**

Department	sys eng 5271	mech eng 5272	chief eng 5275	adv eng 5276	devops 5316	tool eng 5319	met mfg 5323	devops q 5345	test 5364
WBS									
111 Injector Design									
requirements	x	x	x	x					
concept trades	x	x	x	x					
concept analysis		x	x	x					
concept layouts		x							
design to cost	x	x							
weight and Cg		x							
valve identification	x	x	x						
sub flow experiments		x			x			x	x
CoDR	x	x	x		x				x
action Items			x						
PDR activities----------									
CDR activities----------									
112 Injector Fabrication	x		x		x	x	x	x	x
113 Injector Test			x						x

Bogies by WBS/year

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- **Purpose: Allows the estimator to surface potential high risk areas.**
- **Who: Program Manager with help from the estimator.**
- **What: Breaks down bogies to the individual WBS levels.**
- **Where: Usually not posted.**
- **When: Before the first pricing and after the WBS Dictionary**
- **Why: To identify the WBS elements with serious cost problems.**
- **How many: 1 time.**
- **Example:**

Cost

	Year 1	Year 2	year 3
WBS 100	.5 M	.3 M	.1 M
WBS 200	4 M	7 M	9M
WBS 300	3.5 M	4M	6M
WBS 400	2.5 M	3M	5M
WBS 500	1.5 M	2M	3M
WBS 600	3 M	4M	5M

New Environmental Impacts

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- **Purpose: To identify new environmental waste streams for costing purposes.**
- **Who: Manufacturing Engineer, Test Engineer and Environmental Engineer.**
- **What: List of new waste streams and amount/month generated.**
- **Where: Probably done in the areas where the waste stream is generated.**
- **When: Usually after or during the manufacturing and test plan**
- **Why: New waste needs to be costed.**
- **How many: Once**
- **Example:**

  1. Hogout will output 200# of xyz per day.

  2. Processing new resin cleanup emits 40 gals NMP/day for 30 days.

Program Master Schedule

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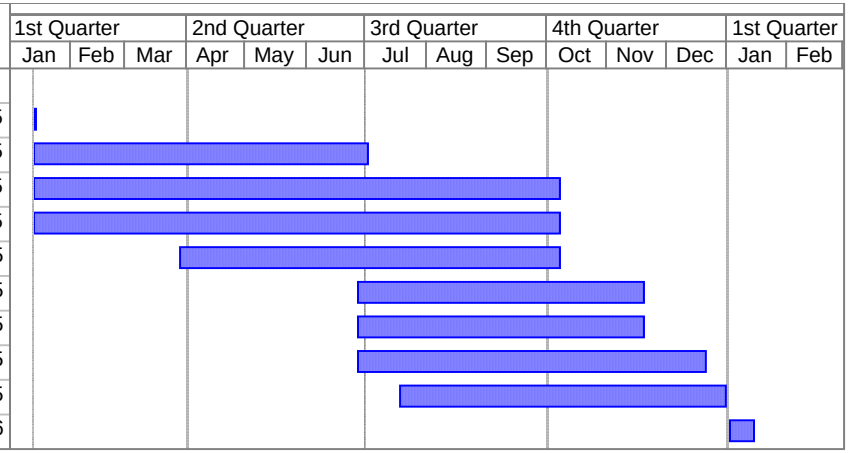
- **Purpose: To establish a timeline for all proposed tasks by WBS.**
- **Who: Project Engineer, Program Manager or Scheduler**
- **What: WBS oriented tasks with milestones and critical path.**
- **Where: Usually created in the individual's office but posted in the proposal room.**
- **When: After the WBS dictionary but before the costs.**
- **Why: It's critical for the accuracy of the pricing that the tasks are priced in the right timeframe.**
- **How many: One/updated.**
- **Example:**

ID	Task Name	Duration	Start
1			
2	WBS 111 Start	1 day?	Thu 1/13/05
3	rqmts	122 days?	Thu 1/13/05
4	concept trades	192 days?	Thu 1/13/05
5	concept analysis	192 days?	Thu 1/13/05
6	concept layouts	140 days?	Mon 3/28/05
7	Design to cost	105 days?	Mon 6/27/05
8	Weight and Cg	105 days?	Mon 6/27/05
9	valve identification	127 days?	Mon 6/27/05
10	sub flow experiments	120 days?	Mon 7/18/05
11	CoDR	10 days?	Mon 1/2/06



EBOM,MBOM,QBOM,TBOM

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- Scope: Provides material lists by specific groups to support the program.
- Who: Project Engineer leads but all functions create
- What:Raw materials, subassemblies and services to support the program.
- Where: Usually done in their respective offices-sometimes all done by PE.
- When: Prior to Priced BOM and after Hardware Demand.
- Why: Acts as the basis for the priced BOM
- Example:

Example of an EBOM

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EBOM

item	wbs	PN/task	quantity	unit/meas	when	n/r cost	unit cost	tot cost	why	who
1	100	Combined loads analysis	1	Job	03/01/05		10,000	10,000	telecon-Q	Al's Analysis
2	300	material test samples	36	ea.	4/6/2005	2000	6000	8000	XYZ contract actuals	xyz lab
			MBOM							
1	200	moly sheet-16'x16'x1/4"	3	ea.	3/5/2006		124	372	PO123465	xyz matls
2		PN xyzxyz housing	23	ea.	4/5/2006	500	6053	139719	Annes Machine	
			QBOM							
1	200	x-ray film-24" x 24" x 24"	6	sh	6/1/2006		100	600	catalog xyz	
2		dye pen services	1	job	6/4/2006		300	300	previous contract xyz	
			TBOM							
1	400	propellant-xyz	220	gal	8/1/2006	200	38	8598	catalog xyz	
2	400	vibe tool	1	ea.	8/1/2006		600	600	simPO xyz	

Travel Identified by WBS

- Purpose: To identify the travel participants by trip, length of stay, and transportation needs.
- Who: Usually Program Manager or Project Engineer with help from Procurement and Quality.
- What: A tabular list by WBS/CLIN of number of people traveling, how many nights, what transportation is required, and the reason for the trip. Need to assure yourself that hours exist in that WBS at that time to support the travel.
- Where: Usually done in individuals offices, posted in proposal room.
- When: Needs to be done 2 days before the final costing.
- Why: Trips need to be individually priced.
- How many: Once at the end of the proposal with functional review.
- Example:

WBS	Who	When	Where	Nights	Car
100	2	8-05	LA	3	yes
500	1	4-05	Denver	1	yes

Outgoing Shipping

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- **Purpose: To identify the outgoing shipping requirements for costing.**
- **Who: Project Engineer with help from shipping department.**
- **What: Identification of size, weight, to/from location, quantity, when by WBS.**
- **Where: Ends up as ODC charge-needs to get to cost/pricing person**
- **When: Prior to initial costing, after tool string verifies shipping containers are available.**
- **Why: Moving things around is often forgotten-moving large thing requires special handling estimates.**
- **How many: Once at end of proposal (but allow a week prior to cost for hazardous).**
- **Example:**

Size	Weight	to/from	when	type
4’ x 4’ x6’	1000#	LA/LA	8-01/3-03	wood box
8’ x 6’ x 12’	1000#	Denver/Sac	4-05/6-06	eng cont

ODC Definition

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- **Purpose: To identify and estimate the numerous ODC costs.**
- **Who: Cost estimator and others.**
- **What: Temp Labor, Subcontract Labor, Tech Publications, Travel, Incoming and Outgoing Freight, some Laboratories.**
- **Where: List needs to be posted.**
- **When: After Program and Manufacturing Plan.**
- **Why: Provides specific costing for tasks that are easily forgotten.**
- **How Many: Once**
- **Example:**

WBS	Item Name	calculation	cost	when
– 100	Temporary help	1 SEP x 21 days x 50 $/day	1050	4/2005
– 200	Out Freight	260# to L.A. and back	260	6/2005

Labor Justifications/BOM

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- **Purpose: To identify labor by WBS and task.**
- **Who: Cost Estimator**
- **What: WBS, EBS name, POP, Overview of Task, Functional Description, Estimate and Basis of Estimate.**
- **Where: Gets created, Priced, agreed on and submitted with the Proposal.**
- **When: After Master Schedule and Hardware Demand, before Price.**
- **Why: Both customer and your own company need to understand costs and reasons.**
- **How Many: One set.**
- **Example:**

Labor Justifications

3.1 DIRECT LABOR SUBSTANTIATION

WBS ID: 100
WBS Description: Injector Development
Period of Performance: Jan-05 to Dec-08

Summary

Function	Description	TOTAL HOURS Salary	Hourly	Premium
2	Engineering	4,500		
4	Manufacturing/Advanced Development	1,350	1,350	
	Total Hours =	5,850	1,350	

Task Description

Task Overview:

Designs, fabricates and cold flows the xyz injector.

Subtasks:

Function 2 - Engineering

Supports this WBS with labor necessary to complete the above stated task elements and all sub-tasks as defined per approved Program Plan.

Function 4 - Manufacturing/Advanced Development

Assists Advanced Development Engineering with the design and manufacturing of development and test hardware.

Estimate

Pool	Func	Description	Dept	Start	Stop	Salary SE	Hourly H1	Premium P4
N	2	System Engineering	5271	Jan-05	Dec-08	4,500		
		Establishes reqs, designs injector, follows fab/test-5 SEP x 6 mo x 150 SH/mo=				4,500		
					WBS 100 Dept 5271 Hours =	4,500		

Pool	Func	Description	Dept	Start	Stop	Salary SE	Hourly H1	Premium P4
P	4	Development Operations	5316	Jan-05	Dec-08	1,350	1,350	
		3 SEP x 3 mo x 150 SH/mo=				1,350		
		3 HEP x 3 mo x 150 HH/mo=					1,350	
					WBS 100 Dept 5316 Hours =	1,350	1,350	

Basis of Estimate

Function 2 - Engineering

Round table agreement of the PM, Lead Engr and Cost Estimator on the hours required to support the scope of work.

Function 4 - Manufacturing/Advanced Development

Actual report XYZ on WO xxx shows injector x was fabricated by 3 SEP/3HEP in 3 months on xyz program. This is similar.

Priced BOM

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5.1 PRICED BILL OF MATERIAL BY ITEM NUMBER

PROGRAM: **Low CTE Composite Tubes**

Note: Columns void of data and/or not pertinent are hidden.

DOC Code Legend: WQ=Written Quote; VQ=Verbal Quote; H=Historical Data; ST=Similar To; E=Judgement Estimate

											PO PLCMT MIDPT = 1st Qtr 05	COST ESTIMATING BASIS & FACTORS							(ESC04D)		0.0074	
ITEM NO.	WBS	COMMODITY TYPE	PART NUMBER	DESCRIPTION	UNIT OF MEASURE	NET QTY	TOTAL BUY QUANTITY	PROPOSED UNIT COST	PROPOSED OTHER SUPPLIER COSTS	EXTENDED COST	COST BASIS / PROPOSED SUPPLIER	DOC CODE	DOCUMENT NUMBER	QTR	YR	QTY	COST BASIS UNIT COST	COST BASIS OF OTHER SUPPLIER COSTS	ESCALATION FACT.: 1/12/05	QTY FACTOR (90% IMP CURVE)	INCOMING FREIGHT	COMMENTS BASIS OF ESTIMATE
	200																					
1	200		C6860-50362	xyz Fiber	Lb	40	40	48.00		$1,920	Material Cost Transfer	MT	Egr.Est.	1	05	40	48.00				14.21	*Temp Sensitive*
2	200		C6810-30007	Resin	Lb	25	25	5.00		$125	Material Cost Transfer	MT	Egr.Est.	1	05	25	5.00				0.93	*Temp Sensitive*
							WBS 200 Total			**$2,045**											**$15**	
	300																					
3	300		C6860-50362	xyz Fiber	Lb	5	5	48.00		$240	Material Cost Transfer	MT	Egr.Est.	1	05	5	48.00				1.78	*Temp Sensitive*
4	300		C6810-30007	Resin	Lb	2.5	2.5	5.00		$13	Material Cost Transfer	MT	Egr.Est.	1	05	2.5	5.00				0.09	*Temp Sensitive*
							WBS 300 Total			**$253**											**$2**	
	400																					
5	400		C6860-50362	xyz Fiber	Lb	0.5	0.5	48.00		$24	Material Cost Transfer	MT	Egr.Est.	1	05	0.5	48.00				0.18	*Temp Sensitive*
6	400		C6810-30007	Resin	Lb	1.3	1.25	5.00		$6	Material Cost Transfer	MT	Egr.Est.	1	05	5	5.00				0.05	*Temp Sensitive*
							WBS 400 Total			**$30**											**$0.22**	
							TOTAL			**$2,328**											**$17**	
									Incoming Freight @ 0.74%	**$17**												

2/22/2006

Pricing Phase-Pricing

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- **Purpose: Converts Labor, PBOM and ODC to cost, then adds fee to Price.**
- **Who: Cost Volume Manager.**
- **What: Applies disclosed rates and factors to Price.**
- **Where: Usually in a secure separate area.**
- **When: After Labor Justifications, PBOM and ODC definition.**
- **Why: Resources are negotiated and bought at the price line.**
- **How Many: One**
- **Example**: None

Pricing Phase-Verification

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- **Purpose: Verify costs match tech Volume, Program Plan, Bogies and Management Volume.**
- **Who: Cost Estimator, Program Manager, Proposal Manager, and Business Manager**
- **What: Iterate, reduce scope/hardware, modify make/buy etc.**
- **Where: Usually in proposal room.**
- **When: Prior to Management Review and release to customer**
- **Why: Proposal Cost needs to match Program Plan/Tech Volume and Mgmt Volume.**
- **Example:**

Pricing Phase-Risk Analysis

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- Purpose: Allows the proposal to be reviewed by the functions.
- Who: Functional leads
- What: Either Statistical or Low, Med or High type
- Where: Functional offices
- When: Prior to the management review/release to customer.
- Why: Allows functions to see the work that may come at them
- Example:

Pricing-Risk Analysis

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Risk Assessment Summary

Program:
Program Manager:
Proposal:
Proposal #:

Function	Team Member	RISK				Proposal values			
		Technical	Schedule	Cost	Resources	SH	HH	Matl	ODC
Engineering						8,724	1,546		$3,549
Inert Mfg						267	380		$247
Energetic Mfg						4,895	6,502		$403
Quality						386	429		$20
Test						426	38		$70
Material						226	40	$350,200	$3,502
Program Management						1,600	150		$4,542
Fiscal						800			
Contracts						400	220		
Site Services									
Environmental						117	356	$2,850	$300

Remarks:

Pricing-Statistical Risk Analysis

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- **Purpose: Equates all problems to cost calculates most probable outcome.**
- **Who: Cost Estimator/Analyst**
- **What: Interviews all members of the IPT as to remaining risks, consequences and probabilities, establishes spreadsheet and runs Monte Carlo model which yields a histogram and “S” curve.**
- **Where: all over the plant**
- **When: Prior to final review**
- **Why: Allows a numerical evaluation of risk**
- **Example:**

Pricing-Statistical Risk Examples

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- Questionnaire- Records responses to a fixed set of questions for each member of the IPT.
- Spreadsheet- Enters their answers numerically by risk Breakdown Structure (RBS)- not the same as WBS.
- Analysis software-Crystal Ball or @Risk-10,000 or 100,000 simulations not uncommon
- Histogram- shows probability distribution vs. cost in bar chart
- “S” curve- shows probability vs. cost using a single line.

Conclusions

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- If steps are omitted it costs.
- If steps are done out of order it costs.
- One of the first things get sacrificed is Quality- i.e. tech cost review, peer cost review etc.
- Not assigning tasks with due dates makes people guess at info they need.
- If we don't do the process right we don't have enough money to chase other opportunities.

- If you can, layout a flowchart of your company proposal process. If its different ask yourself how you are getting that piece of information.